HOUSE OF COMMONS

Transport Committee

Oral evidence: The roll-out and safety of smart motorways, HC 26

Wednesday 16 June 2021

Ordered by the House of Commons to be published on 16 June 2021.

Watch the meeting

Members present: Huw Merriman (Chair); Mr Ben Bradshaw; Karl McCartney; Grahame Morris; Greg Smith.

Questions 132–214

Witnesses

I: Sarah Simpson, Transport Planning Expert, Royal HaskoningDHV; Professor David Metz, former Chief Scientist, Department for Transport, and Honorary Professor, Centre for Transport Studies, University College London; and Mike Mackinnon, former civil servant, Department for Transport, and Consultant, MMB Associates.

II: Jonathan Spruce, Fellow, Chartered Institution of Civil Engineers, and Interim Director, Transport for the North East; Becky Needham, Roads Safety Officer, Royal Society for the Prevention of Accidents; and Kate Carpenter, Fellow, Chartered Institution of Highways and Transportation.

Written evidence from witnesses:

- Sarah Simpson
- Professor David Metz
- Mike Mackinnon
- Chartered Institution of Civil Engineers
- Royal Society for the Prevention of Accidents
- Chartered Institution of Highways and Transportation

Examination of witnesses

Witnesses: Sarah Simpson, Professor Metz and Mike Mackinnon.

Q132 **Chair:** This is the Transport Select Committee's second evidence session in our inquiry on smart motorways. Today, we will be looking at the engineering, the business case and the background to the introduction of smart motorways.

We have two panels. In our first panel, one of our witnesses is struggling to get audio. I will ask the other two witnesses to introduce themselves.

Sarah Simpson: Good morning. I am Sarah Simpson. I am associate group director at Royal HaskoningDHV and a fellow of the CIHT. I have spent the past year or so carrying out an independent review of the implementation of smart motorways, as instructed by the solicitors for the family of Jason Mercer, who died on the A1 all-lane running section of motorway.

Q133 **Chair:** Sarah, good morning to you. Our second witness is Professor David Metz.

Professor Metz: Good morning. I am honorary professor at the Centre for Transport Studies, University College London. I was formerly chief scientist at the Department for Transport. My current research interests are in how travel behaviour changes in response to new technology and investment generally.

My interest in smart motorways is because, in one particular case where a smart motorway was installed on the M25, Highways England carried out detailed monitoring of the outcome for the first three years after opening. That presented an opportunity to consider the economic case for smart motorways generally. My conclusion, as I will explain in due course, is that the economic case is much weaker than generally supposed.

Q134 **Chair:** Thank you very much indeed, Professor Metz. A very good morning to you. I should say for the record that Mike Mackinnon is our third witness. He is an engineer who has specialised in traffic control technology since 1969 and worked for the Department for Transport from 1969 to 1995. We very much hope that the technology will bring him back.

I will start, first of all, with the two witnesses we have. I want to talk about the roll-out of smart motorways. What key decisions have shaped the design, roll-out and implementation of smart motorways?

Sarah Simpson: It is quite clear from my review of a wealth of documents, spanning back to 2000, and the 10-year plan that was written then, that the overarching factors that were involved in the decision to move from a dynamic hard shoulder smart motorway to an all-lane running motorway were predominantly focused on cost savings.

That is really evident in the national infrastructure plan that was issued in 2011 and consolidated in a document that examined the spacing of emergency refuge areas that was published in 2012. That specifically talks about the opportunity, because smart motorways were "very safe", to design them to be less safe in order to save costs.

In addition, the way—*[Interruption.]*

Chair: Bear with us, Sarah. Mike, it appears that you have now come through, not at the most opportune moment, but you're here. Could you pause there?

Mike Mackinnon: I'm here, apparently.

Q135 **Chair:** You are now live, and Sarah Simpson is speaking. I have already introduced you. Welcome to the Committee.

Sarah, please continue.

Sarah Simpson: The second point, continuing from that, is on how hazard and risk management has been undertaken. It is clear again, from a series of documents spanning through to 2015, that not all of the hazards that are presented in an all-lane running motorway have been specifically dealt with in design. Instead, a theoretical approach has been taken, looking for mathematical balance. That has drawn, effectively, a false equivalence between different types of hazard on the motorway, rather than looking to deal with specific hazards through the design process.

The third element I would highlight is, effectively, short-termism in the policy position. I have looked at that also coming through. What I mean by that is that in other countries, if you look to how smart motorways are used, they are in many cases, but not all—I acknowledge that—used as an interim measure because they do not have infinite ability to resolve capacity issues or journey time reliability issues. As such, they sit within a wider, longer-term policy. That approach appears to be absent from the UK position.

Q136 **Chair:** Sarah, I want to drill into some of the written evidence you have given us. You stated that "it has been understood since at least 2015" that the "removal of the hard shoulder results in an intrinsically less safe road." What evidence do you have that takes you to that conclusion?

Sarah Simpson: There is a series of hazard management documents that relate to the way in which all-lane running design achieves the safety objective. Within that series of documents there is language that acknowledges the fact that there will be a significantly greater level of live-lane breakdown, and with that a commensurate increase in risk.

In the way that assumptions are detailed within that, by which I mean design assumptions and assumptions to inform the hazard and risk management process, there are further assumptions, including that for every live-lane breakdown somebody, presumably the driver, will exit

their vehicle to take a look. Although they acknowledge that live-lane breakdowns result in a significantly catastrophic potential outcome, which is shown in the way that the hazard is dealt with through that process, that specific hazard has not been resolved in design terms.

Q137 **Chair:** That sounds like a series of assumptions rather than any hard evidence with statistics.

Sarah Simpson: It is. It starts as a series of assumptions, but one would observe that in hazard management those assumptions are underpinned by evidence and examining the facts. In this particular case, they looked at all-purpose trunk roads, which are similar to but not the same as a motorway environment, not least because a motorway is a special road legally. There, you are looking at an increase in live-lane breakdowns, compared with the motorway, in the order of 9%.

The way that hazard management has dealt with that is by saying that safety must be constrained to that level in order to achieve the safety objective. The assumptions are borne out in the data. The latest data, and certainly that within last year's stocktake, says that within the live-lane breakdown risk you have 16 per mile per year on a conventional motorway, as opposed to 62 per mile per year on a motorway without a permanent hard shoulder.

If memory serves me correctly, it is further borne out in figure 25 of the 2020 stocktake, which clearly shows that when comparing motorways with an all-lane running scheme, where that has been implemented, the rates of killed or seriously injured casualties have increased against the predecessor conventional motorway. That is an increase not just against the actual observed data in the predecessor road but also against the counterfactual. There is data that supports that view.

Q138 **Chair:** Thank you very much for the opener. Professor Metz, I will come to you and then I will come to Mr Mackinnon. Do you have views on the key decisions that shaped the roll-out and design of smart motorways? Sarah has obviously gone into a lot of depth. Do you agree with that, or do you have a different view?

Professor Metz: I will not comment on safety aspects, which are not my area of expertise. Increasing road capacity is an expensive business. Shifting earth and pouring rolling concrete tarmac is costly, and therefore the economics of any increase in capacity will depend very much on the costs incurred. In the case of smart motorways, taking advantage of the hard shoulder was a way of minimising the costs, in particular the cost of rebuilding bridges over motorways. Had you expanded, say, from three lanes to four lanes, with a hard shoulder, there would have been extensive reconstruction.

I am not surprised that the economics of the smart motorway scheme seemed, on the face of it, to be much more attractive than other ways of increasing the capacity of the strategic road network. A point I wish to

develop is that the economic analysis has been misleading because the outcomes, in terms of traffic volumes and speeds, have not borne out the forecasts.

Q139 **Chair:** We are going to go into the economic case in some depth as well, so we will pause that there. Mike Mackinnon, a very good morning to you. Sorry about the technology issues that you faced and thank you for getting here with our superb broadcasting team.

I will ask you the same question that I put to the other two witnesses. What is your view on the key decisions that shaped the roll-out of smart motorways? Obviously, you worked for many years at the Department for Transport previously, so you will have a good insight into the culture.

Mike Mackinnon: To be honest, mine is really a personal view. I was involved with, and I did the trial of, controlled motorways, which were the start of smart motorways. I have a number of issues.

One is about the claims that are made for the benefits of smart motorways, because they have already been used. The biggest benefit of any technology that was put on motorways was MIDAS—the automatic incident detection system that was put in during the 1980s. In fact, it might even be questioned that smart motorways are actually deteriorating some of the benefits, because under normal accident situations, which the systems were originally designed for, it was all about lane control and management. Strangely, with a mixture of the advisory and instructive signs we had then, the control might be seen to be better than it actually is with mandatory signals for all situations, because of the reaction of drivers. For instance, a 20 mph mandatory signal on a motorway when they see no reason for it at all, and it is not associated with traffic capacity, is a problem.

I am a practitioner, so I do not have any proven statistics, but I have spent my life on motorways making safety cases for technology systems and trying to stop them being used where it is inappropriate. They look as if they are a cheap fix, but in reality they do not necessarily turn out to be that.

In trying to prepare evidence for this, I started off just looking at the basic case. When we started with a motorway design system back in the 1950s, somebody decided that a motorway was going to be a special road with three lanes and a hard shoulder. I cannot imagine that they would have met those design criteria easily without having very good justification. I find it very difficult that, some years later, people could claim that taking the hard shoulder away is an improvement.

Part of the problem may be that if I did a safety case on this, from a technology point of view, the first problem is that I know, looking at it, that there is a foreseeable risk of a fatality by just moving to that thing, which clearly has been borne out. The first question I would ask is, how are you going to cost it? I know that the Department has costs for a life,

but that is a bit different from making a design decision when you already know that that is going to be an outcome; somebody is going to be killed because of that. You obviously have much better people on the panel to know how you offset that against other economic benefits, but I do not see how you do that.

I query the data. Questions I would ask would include: how many accidents have occurred because there was no hard shoulder, and how many of them were actually fatalities? What is the percentage compared with general accidents? General accidents on a motorway—at least in my understanding—are random. They are due to vehicles breaking down and drivers making mistakes. These accidents are due to a vehicle or a driver in a situation with no safe haven. You have people getting out of cars. How do you get disabled people out of cars? All of those issues should be somewhere in the safety case.

I did some work with the agency on enforcement systems, going forward. I asked whether they had returned to the original Department standards—

Q140 **Chair:** Mr Mackinnon, I am going to interrupt you just so that we can keep to a structure. Let me ask you this. In your experience, has the Office of Rail and Road, which is the highways regulator, been effective, or does it lack the powers to govern safety in this realm?

Mike Mackinnon: In my view, this is a safety-critical issue. It is covered by legislation. The authority are the people who have the responsibility.

Q141 **Chair:** Do you think that they have done a good enough job?

Mike Mackinnon: No, I don't think so.

Chair: I want to bring in—

Karl McCartney: Sarah wants to come in on that.

Q142 **Chair:** Actually, I am going to bring you in, Karl. I think you wanted to come in before Sarah did.

Q143 **Karl McCartney:** I did. I want to go back to you, Sarah, and ask a few questions pertinent to some of the evidence you have already given.

I do not wish to denigrate the research you have done, but has it all been desk based and looking at the written word, or have you spoken to, or taken any evidence from, those who work as recovery vehicle operatives on the motorway system, be that with a hard shoulder or without?

Sarah Simpson: The work has been desk based. It has, effectively, been an extensive literature review, as comprehensive as possible given some of the challenges in obtaining some of the historical reports.

I have, however, been made aware of various testimonies and written submissions by people like roadside recovery operatives who have raised

concerns. I am certainly aware of those very well-publicised concerns. The specific report was not a forum to examine that form of evidence.

Q144 **Karl McCartney:** The reason I ask is that we know about the accidents that happen and are recorded, but obviously near misses are not recorded. Those near misses will be people who have broken down or the people who have been sent to recover them. I do not think there is going to be any way of finding that information unless somebody has spoken to lots of operatives to get an indicative figure.

Sarah Simpson: I would agree. I touch on the problem of that missing piece of the puzzle. That missing piece extends back to 2002 in the way that the original trial assessment was developed. Although, from my reading, the assessment methodology was very comprehensive, the obvious area that it missed was in collecting near-miss data. It had a certain level of confirmation bias with regard to how the public would respond. I appreciate that this is retroactive, but it seems as though that level of confirmation bias and that missed opportunity has persisted through the development and operation of the smart motorway schemes.

Q145 **Karl McCartney:** I understand that you are aware of some of the information from those who have to work on smart motorways or other motorways. Have you broken down yourself on either a normal motorway with a hard shoulder or on an all-lane running motorway? Do you have personal experience of having to sit there and wait? It's all right if you haven't. I just wondered.

Sarah Simpson: I have not broken down, but I have witnessed very alarming near misses, including one just two weeks ago with a heavy goods vehicle very narrowly avoiding a broken-down car in lane one on the M1, which was disturbing. About two miles later there was a further broken-down vehicle, again in lane one.

I drive extensively for work, although not so much in the past 12 months. Obviously, working in transport and highways I have to go and look at roads. Now, as a matter of course, one of my road safety auditors videos using a dashcam. She records her journeys because we are seeing so many live-lane breakdowns and so many pedestrians on live carriageways.

Q146 **Karl McCartney:** In the research that you have done so far on smart motorways—as they are called—are you aware of how many are fully covered by CCTV, and how much coverage is working full time? Do you have those figures? If you do not, does Mike?

Sarah Simpson: I would want to ask what the underlying question is. I am aware that some people are asking about CCTV on the presumption that CCTV is used to actively monitor the roads. In the case of all-lane running, that simply is not the case.

To a certain extent, the level of coverage that is possible is a little bit redundant in that respect because it is not actively used for monitoring.

Forgive me if I have misunderstood your underlying question, but I just make that observation.

Q147 **Karl McCartney:** Thank you, Sarah. Mike, you have your hand up.

Mike Mackinnon: CCTV on the motorways was to a Department standard. It was just for general monitoring. First of all, it cannot see all of the motorway. It is like shining a torch down. There is a dead patch, whatever you do, underneath wherever your camera is. The number of displays you would have in a control room for a county set of motorways, if they all had full CCTV standards, would probably be 200 or 300 pictures. It is not feasible for humans to monitor the CCTV cameras that they have 24 hours a day, but of course this issue is 24 hours a day in any weather conditions.

Karl McCartney: Thank you for that, Mike.

Q148 **Chair:** Witnesses, that first section was supposed to take 10 minutes, and we have doubled that. Can I ask you to give us very succinct answers, evidence-based and with your opinions, but without the bits around? Then we will crack through this and get your excellent evidence.

I want to put a few questions to Professor Metz, and perhaps you could give me brief answers. First, do you agree with the Government's view that if you did not have smart motorways you would end up with more traffic on the A roads, and therefore more deaths because they are more likely to occur on A roads?

Professor Metz: I think that is a difficult conclusion to reach. We have a mature road network in this country. We have areas of very high population density and high car ownership, so there is always more potential demand for road use than can be met. We recognise that by limiting our ambitions to build new roads. You can regard the smart motorway investments as a marginal increment in a situation where we accept the finite nature of the road network.

Within the network as a whole there are patterns of travel that are established and new patterns that emerge. One important innovation is satnav devices, which give people new routes that they will not have known about, including shortest time routes. There is some evidence that we are getting diversion of local traffic on to motorways when new capacity is added because it offers a shorter route; a dogleg route rather than a direct route. It is a shorter time but, on the other hand, there is more fuel consumption. The time savings are offset by increased vehicle operating costs.

I do not think that one can generalise about the overall impact of any particular increase in capacity such as the smart motorway system, nor do I think that the models available allow us to draw those conclusions. The situation is quite complex. The models are quite opaque and, in my view, they cannot be relied on. I do not really think that simplistic

conclusions about, "What if we did this or did not do that? What would the impact be elsewhere?" are feasible.

Q149 **Chair:** You will have seen the predicted numbers of traffic volumes by 2050. They range from an increase of 35% to 60%. Do you believe that smart motorways are the only feasible and affordable way to respond to that increase?

Professor Metz: I do not believe those projections made by the Department for Transport and based on its national transport model, because I do not think they recognise the constraints.

There are two key constraints about how far you can travel. One is time and the other is speed. Average travel time has not changed for the last 50 years. It is about an hour a day. Time is always a limiting factor in travel behaviour. Speeds cannot really increase. We cannot travel faster on our road network safely, and we cannot increase capacity sufficiently to significantly reduce congestion. My conclusion is that the total amount of road travel is largely driven by population growth, which, people are now concluding, will be reducing for a variety of reasons. I think those national transport model projections out to 2050 and beyond of traffic volumes are misconceived.

We will live with the road network we have, and we will accommodate the volume of traffic we can manage. We will make other provisions such as rail investment where that is not sufficient. We have the potential to manage the operations of the road network for reinvestment in digital technologies, as opposed to costly civil engineering technologies.

Chair: Thank you. I will pause it there. It is time that we moved on to another section. We are going to look at the economic and business case for smart motorways, and whether the economic benefits are worth perceived or actual risk to safety.

Q150 **Mr Bradshaw:** You all basically seem to be saying that this is a way of delivering extra motorway capacity or new motorways on the cheap and, in the process, jeopardising safety. I suppose, if there was a strong economic argument, you could make a public policy case for this type of motorway.

Professor Metz, you touched on some of the research you have done on the economic case. The Government claim a return of £3 for every £1 invested. Can you go into a bit more detail about why you think those claims by the Government are flawed?

Professor Metz: I have looked in detail at a particular smart motorway scheme between junctions 23 and 27 on the M25, which opened in 2014. Highways England, to its credit, carried out detailed traffic monitoring before the scheme opened and for the three years after, and published the data. We found that traffic flowed faster one year after opening, but by year two that increase in speed was lost and it was confirmed in year

three. The reason was a substantial increase in the volume of traffic, a 16% increase in volume from before opening.

At that point, Highways England claimed credit for moving more people and more goods without any loss of travel time or reliability. When I saw that, I realised that that could not have been the economic case to justify the investment. The economic case for any transport investment is always dominated by the saving of travel time, which the Department goes to great effort to justify.

I made a freedom of information request to see the reports of the modelling work so that I could compare the outturn with the modelling forecast. What I found was that the model substantially under-projected the volume of traffic and over-projected the speeding up of traffic, which then fed into the economic case that generated a benefit-cost ratio of 2:9 at the point when the investment decision was made. The benefit-cost ratio means it was high value for money, but we did not see those time savings in the outturn, so the benefit-cost ratio outturn is much lower than was claimed. This is a problem both of the modelling, where there is some optimism bias built into these very opaque and complex models to generate the kind of outcome people expect, and the monitoring. We are just counting traffic. We are not distinguishing different classes, or even freight vehicles from cars. That does not tell you what benefits you are getting for different classes of road users.

The economic case for a scheme is always dominated by the benefits for business users, both people travelling in cars on employers' business and freight, whereas the economic benefits for local users such as commuters and others are much less. Most likely what has happened with the M25 scheme is that there has been a big growth, much more than expected, in local users and people commuting to and from work; it is the same trip, basically, but diverting to the motorway to save a few minutes at the cost of increased fuel consumption.

That is one case study, which I did because the data was available. I think it is quite likely to be a general situation because the strategic road network is under greatest stress near areas of population density, where you have a mixture of local users and long-distance users. Remote from those areas, the traffic mostly flows through them, but near population centres you have local users and we have no means of controlling that. If we had a toll road system, we could set the tolls to manage that. The one example we have is the M6 toll road in the west midlands, where the volume of traffic is about half that on the M6 itself because local users will not pay the toll, naturally. That is a special case.

I think the general problem, or my concern, with the smart motorway investment programme is that we are attracting local users on to the additional capacity, pre-empting capacity intended for long distance business users. We are misleading ourselves about the outcome because when we monitor we are not distinguishing the different classes of users.

Q151 **Mr Bradshaw:** Can you put a figure on it yourself? You say you do not think the Government's 3:1 cost benefit is right. Is there any cost benefit or is there a negative cost benefit from your analysis?

Professor Metz: I have only had access to the reports of the modelling and not to the models themselves. In any event, I would not be competent to operate them.

There is a risk that the benefit-cost ratio is negative because the longer trips made by local users will generate more externalities, in particular carbon. That is a negative in cost-benefit analysis. The worst economic case, which I think is quite likely, is that we increase capacity through smart motorways, we attract more local traffic doing longer trips, we emit more carbon and we end up with, potentially, a negative benefit-cost ratio. I think that the economics of the smart motorway scheme need to be carefully reconsidered in the light of the available monitoring data.

Q152 **Mr Bradshaw:** Thank you. You have given a very comprehensive reply. Does that not slightly play into the Government's hands? They are arguing that if you take any traffic off local roads on to smart motorways it is safer, because trunk roads are less safe than smart motorways.

Professor Metz: The presumption in that question is that there is a fixed amount of traffic and that, if it is shifted to a safer road, it will be safer. But there is not a fixed amount of traffic. If we take traffic off local roads through a diversion, there are plenty of suppressed trips, so to speak, which will come in and take up the space. I would not expect there to be a net saving or a net benefit in terms of accident reduction through diversion.

Q153 **Mr Bradshaw:** Sarah, do you have anything to add that you do not think the Professor covered on the economics of this?

Sarah Simpson: I would purely extend Professor Metz's point by observing that exactly the same tendencies have been identified in data from the Netherlands and from the Wellington smart motorway scheme, whereby any benefits are particularly short term and journey time savings are removed by year two or year three.

Mr Bradshaw: We are coming on to international comparisons a bit later, so you will have a chance to expand that. Thank you.

Chair: We are now going to look at the removal of the hard shoulder and the risks of a live-lane breakdown to get your evidence on that section.

Q154 **Greg Smith:** Good morning, witnesses. As the Chair just said, I want to focus on the risk analysis of the removal of the hard shoulder and what that means across the whole of the road network of the likelihood of a serious accident crash, potentially leading to a fatality.

To start that, we have had evidence as a Committee that 50,000 live-lane breakdowns occur across the whole strategic road network a year. That was the number for 2019. Why is there all this focus on smart motorways

when we are actually seeing the same problems and the same risks on A roads, some of which are three-lane running, when a car breaks down? Sarah, could you open on that?

Chair: Are you hearing Greg okay? You all look very strained.

Sarah Simpson: No. He is very quiet.

Chair: Broadcasting team, I don't understand that. Greg is coming across loud and clear here.

Greg Smith: Is this microphone not working?

Mr Bradshaw: That's better. It is often a problem with people in the room. We cannot hear them as well as people who are on Zoom. It is better now.

Q155 **Greg Smith:** I'll start again. I want to focus on the risk analysis across the whole strategic road network. My first question, the opening gambit, is that in 2019 there were 50,000 live-lane breakdowns across the whole strategic network, pulling in conventional motorways and A roads, some of which are three lanes, as well as smart motorways. Why are we ploughing all this attention on to smart motorways when, in reality, cars are breaking down in live lanes on other roads all the time? Shouldn't we have a broader focus on how we tackle the other roads as well? Why is there all this attention on smart motorways?

Sarah Simpson: I am sorry you had to repeat yourself. It has come through now, thank you.

It is worth very quickly reflecting on the data, because that is salient. On conventional motorways, which we have 1,500 miles of, give or take, we had in the order of 25,500 live-lane breakdowns on that network in 2019. On motorways without a permanent hard shoulder—all-lane running, all dynamic hard shoulder running—we had just shy of 13,000 live-lane breakdowns on a network of 200 miles. As I mentioned earlier, and I appreciate that this is quite a blunt way of looking at it, if you break that down into the number of live-lane breakdowns per mile per year, you have 16 on a conventional motorway and 62 per mile per year on all-lane running or dynamic hard shoulder running.

To speak to your question, the reason why, in my view, given all the evidence, we are particularly concerned with that is that the all-lane running, like the dynamic hard shoulder running, has imposed a new hazard on that form of motorway, which is the absence of the place of relative safety—the hard shoulder. The substantial difference between all-lane running and dynamic hard shoulder is that the dynamic hard shoulder schemes were deliberately and comprehensively reviewed in terms of the technology and the operational means by which the hard shoulder is opened and closed. There was a certain degree of fail-safe baked into that design. That is absent from the all-lane running scheme.

What we have is a substantially higher number of drivers stranded in a live lane. I am sure that Mr Mackinnon can shed some further light on this, but given the research and the data in the research that I have reviewed, we have a MIDAS that does not work in the way that was envisaged when that hazard management was undertaken in 2012, 2013 or 2015. We have stopped-vehicle detection that only detects, according to the 2016 research, in the order of two thirds of all stopped vehicles.

The hazard management, and the only mitigation for these live-lane breakdowns, which again, to remind you, assumes that for every one of those breakdowns people exit their vehicle, is to rely on unreliable technology and the braking lights of vehicles following the broken-down vehicle. That is the sum total of the mitigation.

When you look at the way that the hazard management is dealt with, it is very clear that those mitigation measures do not fully resolve in design or operational terms the hazard and risk to drivers. As a result, the real-world implication is that drivers are stranded in a live lane. They are effectively left on their own to navigate that situation. Thankfully, most of us do not make a habit of breaking down, so just the fact that they are broken down is a novel experience for most drivers. The responsibility to recover the vehicle and remove it is imposed on those drivers as well. In that respect, the UK situation differs from overseas, and also differs from our own approach in other environments where the facility of safe refuge is not provided. I am thinking of roadworks in this instance, where you will be familiar with the yellow signs offering free roadside recovery.

Operationally, drivers are not enabled to actually deal with that. The Go Left campaign, while clearly effective and having a good amount of recall, does not speak to that issue either. There is a material difference between a live-lane breakdown, a significantly lower level of risk by virtue of the significant difference in incidence of live-lane breakdown on a conventional motorway, and people having at least the option to physically get off the live lane. That is materially different from acknowledging the fact that that would be the case and acknowledging the fact that people are more likely to die or be seriously injured in that situation, and then failing to resolve that in design terms, operational terms, enforcement terms or driver awareness terms. I think it is that combination which is particularly lethal and particularly of concern to the public, campaigners and various other groups.

Q156 **Greg Smith:** Thank you. That was a fascinating answer. Can I dig in on a couple of points from that? As we are taking these assessments now in 2021 terms, at a time when the technology in the cars we currently buy is changing massively—my car goes bananas if I get within about five car lengths of another car on the motorway; all the sensors show warnings, and more and more cars have anti-collision detection technology in them—equally we are about to see a total change in the breakdown of the sort of vehicles that are actually on our roads. It is possible that we are assessing the safety of roads in 2021 when actually, in a few years,

the profile of live-lane breakdowns could be very different.

More and more electric vehicles are going on to the roads. You can imagine that there are going to be more breakdowns as people run out of electricity, particularly as batteries degrade and the range is not as good as it was when the car was new. Is the assessment of the number of live-lane breakdowns that we have actually robust enough to take into account the changing technologies of what is on our roads?

Sarah Simpson: I am quite concerned about the forecast, and how that forecast change in fleet is being dealt with. Even prior to the change—I appreciate what you are saying about its being a total change, but it will be a slow change to an electric vehicle fleet—there is a more pressing concern. This may or may not be the forum to get into it. I am not seeing any response to it in terms of what the use of observed data will look like going forward. It is the use of autonomous cars. I am particularly thinking of cars with ALKS technology, or vehicles, I should more correctly say. Vehicles with ALKS technology are due to be properly let loose on to motorways later this year.

I think there are substantial concerns that have certainly been presented by other more informed people. I am very aware of the concerns, particularly in the roadside recovery organisations, about what that means in practical terms. The real-world outcome is that ALKS-enabled vehicles only have one response to live-lane breakdowns, and that is to brake. It is not to swerve or do any other kind of thing that a human driver would do; it is only to brake. Depending on whether a driver has responded within the 14 or so seconds that they have, given the initial warning and then the transition warning, there is huge potential over the next few years, and certainly before the completion of the stocktake measures in September next year, for the situation to get considerably worse before technology is implemented to give it any hope of improving.

Q157 **Greg Smith:** Thank you very much. Mike, do you have any thoughts on the robustness of the analysis and the changing pattern of what is actually on our roads?

Mike Mackinnon: I have done some work. I don't have any detail apart from a personal view. I have a couple of points on your first point about roads that already have no hard shoulder. I have not seen anywhere that somebody has recognised that we drive differently on all-purpose roads. We have an expectation of things that we do not have on a motorway.

Generally, on a motorway, the average speed is higher. There are quite a lot of differences that would need looking at carefully before you try to compare them. In fact, I wrote a paper for the Transport Committee in 2011 about levelling out the congestion on all-purpose roads. Part of the idea there was that you add lanes to all-purpose roads to get some of the benefits that a hard shoulder provides. There has been no mention in anything I have seen about how long it takes emergency services now to get to an incident when there is an accident on all-lane running.

On Sarah's point, on the M42, which is part-time running, again the issue will be when these incidents happen because the fourth lane is used. Generally, the average speed is slower because you are getting towards congested traffic. The problem with all-lane running is that you can have an incident where there is low traffic and higher speeds.

Q158 **Greg Smith:** David, we are quite tight on time. Do you have anything quickly to add to that question before I come on to my last point in this section?

Professor Metz: The question of vehicle automation is obviously quite important. What is intended in the near term is quite low-speed automation under quite congested conditions. In the longer run, as one goes to more general vehicle automation, there must surely be an expectation of a major improvement in overall safety. That will have to be reconciled with the nature of the road infrastructure. We have barely begun to think about that.

Q159 **Greg Smith:** My last question for all three of you is this. In the evidence we have taken as part of this inquiry, the Chartered Institution of Highways and Transportation told us that "crashes are caused by human behaviour, not the presence of a safety feature."

What are your thoughts on whether they are right, and how far can we actually go to build any sort of road? We have to accept that humans make mistakes. It is ultimately down to what all of us as individuals do behind the wheel of our car, and the safety features on that car. Inherent in that, is it ethical for us to say on the one hand that certain safety risks have to be taken as read, so long as overall safety and a number on a spreadsheet says that the overall position is just fine? Is that a correct thing to do?

Professor Metz: The questions you pose are quite difficult. They are almost moral questions. We were probably saved from that over the years by focusing on improvements. There has been a huge improvement over the years in, for example, the number of deaths on the roads, but that improvement has stalled in recent years at about 1,700. For any particular scheme, we have always been able to make out the case that a new road will be safer than an older road, and therefore we can claim economic credit for that in our cost-benefit analysis.

I think the issue that is now arising with the debate about hard shoulders is how you accommodate a potential worsening of the situation and what would be the public's value of a life lost rather than a life saved. We need to get back on track to keep reducing the number of road accidents and the number of casualties. In that context, I think we can be more relaxed about the quite difficult issues that you are raising.

Q160 **Greg Smith:** Thank you. Mike, what are your thoughts?

Mike Mackinnon: One goes back to the bit you have just come from. My guess is that the safest roads will be when there are no drivers, in blunt

terms. When we have gone to fully automotive vehicles and we do not need a technology system external to the vehicle, the vehicles will talk to each other. Failures of the system will be taken care of by the vehicles. As the Professor and Sarah said, the only thing that is going to happen is that they will just stop. It is to do with how all the rest of the vehicles following behind stop.

We will not deal with the problems of stopped vehicles with our current technology. It is not a safety-critical system. It depends on where the vehicle is in relation to the signals, and the difference in time before a signal even gets up and people understand it and can obey it; you cannot tell people to change lane when there is no lane to change to. The only thing I would say is that maybe we have to change our economic basis and try to reduce congestion by having a change of vehicles, not by trying to change traffic patterns, and make the rest of the road as safe as we possibly can.

Q161 **Greg Smith:** Thank you. Sarah?

Sarah Simpson: To deal with your three questions in turn, as to whether the CIHT is correct to say that crashes are caused by human behaviour and not the presence of a safety feature, that is correct but it is not the full story. The adopted position of Highways England and the Department is to have a safe-system approach to road safety, which is about eliminating the number of people who die or who are seriously injured on roads. The presence of safety features cannot eliminate crashes, but it can absolutely reduce the severity of a crash.

That is hugely salient, to move on to your second question about how far we can go, because the absolute bare minimum that we should be doing as designers, operators, organisations and roads authorities is dealing with hazards that are presented that are foreseeably going to result in death or life-changing injury. With regards to all-lane running, that simply has not happened. If you look anywhere else in the built environment—in construction—that absolutely would not be the case. If you look to the CDM regulations, for example, individual hazards that could result in that type of outcome would be absolutely compelled to be dealt with through design and risk management. That simply has not happened with all-lane running.

On your question regarding whether it is ethical to say that certain safety risks can be dealt with in the aggregate rather than individually, my position is very clear, and it is borne out by the evidence. It is a simple no, it is not. That is why, in other areas of construction and the built environment, we do not have this approach to the health and safety of the users of that infrastructure. Yet within the road environment, for some reason I cannot get to the bottom of, we seem organisationally to be satisfied with a hypothetical and theoretical mathematical approach to hazard management.

Unfortunately, it has been left to campaigners and the public to raise awareness of that. It is all well and good to have a designer or an engineer, or governance within an organisation, considering levels of tolerable risk, but unless the public is drawn into that debate, we do not know whether a risk is socially tolerable. What we see in this debate is a very clear indication that the risks for life and limb and for users on all-lane running are absolutely intolerable to a significant section of society.

Greg Smith: Thank you very much. Mindful of the clock, I will hand back to the Chair.

Chair: Witnesses, can I ask you to be very succinct? We only have seven minutes remaining and there are still two sections for us to cover. The first is international comparisons.

Q162 **Mr Bradshaw:** I always get slightly unsettled when we are doing something that nobody else in the world appears to be doing. It could be that we have a great idea and we are in the vanguard, but it could also mean that we are doing something rather stupid. Sarah, you touched on some of the international experience earlier. Very briefly, could you give your view about what we could learn, or whether other countries are doing what we are doing and, if not, why not?

Sarah Simpson: Other countries absolutely have smart motorways, and some countries have had them for longer than we have, but nobody is doing them quite as we are. There is greater use of dynamic hard shoulder running. I am thinking specifically of areas like Germany and the Netherlands. They are operated on a time-bound situation. Whereas we bring them in and out as congestion ebbs and flows, in the Netherlands, for example, you might have a 12-hour defined period when the hard shoulder is brought into being. I think that diminishes the potential for confusion. All-lane running is used in Australia and New Zealand. They are covered by off-road principles. The amount of technology monitoring is different and more extensive than in our systems.

The other thing I would point out, which I alluded to earlier, is that operationally the way that obstructions and live-lane breakdowns are dealt with in different countries is different from our approach. It is seen more as an operational imperative that the vehicles are removed. In Wellington, as I say, a roadside recovery vehicle is posted close to the road just to deal with that, as and when it arises. In the Netherlands, roadside recovery is free at the point of use. It is seen as part of the blue light response to live-lane breakdowns.

Q163 **Mr Bradshaw:** David, do you have anything on international comparisons?

Professor Metz: No, I am sorry, I cannot contribute anything on that.

Q164 **Mr Bradshaw:** Mike, how about you?

Mike Mackinnon: Nor me.

Mr Bradshaw: That's fine. Thank you very much. We have made up some time.

Chair: Let's go to Grahame Morris for the last section, which is around the Government's action plan and their stocktake.

Q165 **Grahame Morris:** I was very interested in the earlier evidence from the witnesses. You may be aware that one of our predecessor Committees looked at this issue back in 2016. In fact, the predecessor Committee did not support the roll-out of all-lane running because the safety risks had not been fully addressed or assessed.

I want to be absolutely clear. I have a picture, but just for completeness could I go to you, Sarah? I was fascinated by what you said about hazard management documents. Does the Government action plan go far enough on safety, or should more be done to improve the safety of smart motorways?

Sarah Simpson: At the risk of sounding like I am dodging the question, it is very difficult to say. Because the data in the stocktake that has been made available is not the same for different types of smart motorways, it is impossible to carry out a like-for-like comparison of the operational concerns in each of those types of motorway. The other aspect is that in the action plan there is no transparency as to how the measures have been derived, how they are being prioritised or on the magnitude of the effect on road safety that each of them is expected to deliver, both individually and collectively.

In the absence of that data, it is very hard to say. I have concerns around the speed of delivery, even with the accelerated roll-out that has been identified by Highways England. I am concerned that there is a level of, perhaps, inconsistency in the way that measures have been prioritised. I am thinking particularly about the enforcement of Red Xs, for example, and that kind of thing, which can have a material difference operationally in how all-lane running works.

Q166 **Grahame Morris:** David, I will come to you, and Mike last, on the same question, particularly in relation to the action plans that are proposed. Will they make the smart motorway safer? I am thinking about the emergency refuge area proposals.

Professor Metz: I won't comment on safety aspects, I am afraid, because that is not my area of expertise. I would point out that there is really quite a lot of momentum. There is a £27 billion, five-year road investment strategy, for which smart motorways are an important component. There are 10 smart motorway schemes in that.

Once such schemes are proposed, there is a lot of momentum to implement them. It is not to ride roughshod over the safety issues; that would be going too far, but it is a tanker that is hard to change course. I think an issue for the Committee is whether you want to recommend a reconsideration of the smart motorway investment programme on grounds of the safety issues, which you have thoroughly investigated, the

economic issues, which I have questioned, and then the broader context of net zero and what road investments are doing there. Putting those three elements together, to me, points to a rethink in the near future.

Q167 **Grahame Morris:** I am grateful. Thank you. Mike, do you have any final thoughts on where we should be going as a Committee in relation to smart motorways?

Mike Mackinnon: My personal view is that there should be very hard and long thought about whether you continue with all-lane running. There is the mitigation of ERAs, which are dangerous in their own right. We had the same thing with motorway phones. How many people actually stop at the ERA and how many people stop on the road, wherever they are, because they have no choice?

The existing signalling system is not built to be safety critical. There are maintenance issues, and a whole host of issues that mean it is not really, in my view, a mitigation system at all. You come back to the crunch, which is that you are going to have people killed by all-lane running. However, somebody can come up with data that they are happy with, and a description of "safe" that they want to put against that. In my view, that is a political and not an engineering issue. I think Sarah put the whole issue about the case very clearly.

Grahame Morris: Thank you very much for being so succinct in that section.

Q168 **Chair:** It would be remiss of me not to ask if you had listened to the "More or Less" feature on Radio 4 that took evidence from Claire Murray, a transport planning consultant. Sarah, did you hear that at all? It picked up some press.

Sarah Simpson: No.

Q169 **Chair:** In that case, I won't bother asking. I will just make the point to you, because this is all about opinions, different models and different views. She found that the average number of fatal casualties fell after roads were converted to smart motorways. The average number of serious casualties also fell after conversion to all-lane running and dynamic hard shoulder motorways. A reduced casualty rate was found to be statistically significant for all-lane running.

She found the complete opposite from what you are pointing me towards, Sarah. Obviously, you have not drilled into how she came up with that methodology. I wonder why it is the case that so many different opinions can be found on the same subject.

Sarah Simpson: If I take that completely at face value, if I understand correctly, she put together dynamic hard shoulder running and all-lane running. The two are different. If I am being asked about all-lane running, as I say, the way that the hazard of the lack of hard shoulder has been dealt with is materially different in all-lane running from the way it has been dealt with in dynamic hard shoulder.

The evidence and the data in the 2020 stocktake is quite instructive on that. It clearly shows that the dynamic hard shoulder running safety outcomes—the numbers of people who die or who are seriously injured—are materially and significantly different from those associated with all-lane running. If you are going to lump the two types of road in together, the effect of the dynamic hard shoulder running will affect the outcome.

Q170 **Chair:** Is that similar to a point we have discussed before? Effectively, when a motorway goes to a smart motorway, it becomes safer but you reduce that level of safety as soon as you take the hard shoulder away? Is that another way of getting to the point you made?

Sarah Simpson: If it goes to a controlled motorway and if MIDAS is installed, it is clear that safety outcomes improve. When it goes to dynamic hard shoulder running, the 2012 report that I alluded to earlier, and the data in the stocktake, show that safety outcomes are improved. The numbers of people who die or who are seriously injured decrease as a result of that. The salient point is that that positive change was acknowledged by the designers in 2012. It was seen to provide some scope to change the design through value engineering, literally designing the road to be less safe in order to save costs.

The data that we see in terms of no particular change in slight casualty outcomes, increased severe outcomes and differences in fatal outcomes depend on which road, in aggregate, supports the change and the compromising of road safety on all-lane running compared with dynamic hard shoulder and controlled motorway.

Q171 **Chair:** The last point to you, because David and Mike addressed this in Grahame's question. If you were the Secretary of State for Transport, what would you do with the 141 miles of all-lane running?

Sarah Simpson: I would acknowledge the fact that induced traffic exists and that it is not the case that 25% of traffic will simply be lifted from all-lane running and deposited on to local roads and A roads. We have known about that for decades. I would urgently put some interim measures on to all-lane running to change the safety outcomes of that road. What that looks like in practical terms could be any number of different things, but it needs urgent and very deliberate close attention.

Q172 **Chair:** Would you return the hard shoulder to that 141 miles?

Sarah Simpson: Potentially, yes. Given all the evidence, I would have to say, if you are asking me whether we should have any more all-lane running or remove it, that my answer would be to get rid of it. I would always say, though, that the controlled motorway should be the minimum standard for our motorways because the safety benefits are so clear for all to see in the data and in the way that it manages traffic.

I would like to see smart motorways on the basis of them being controlled. I am more agnostic about dynamic hard shoulders. It was identified in 2002, and then in 2008, that for them to work there must be

good driver education and good public consultation, or else confusion ensues. My point would be that we have confusion in both dynamic hard shoulder and all-lane running. It is just that the confusion happens when all-lane running fails to work for drivers—in a live-lane breakdown situation. Arguably, in that case, if you have driver confusion, the outcome will be more lethal.

Chair: I think you have stirred Ben to a final question.

Q173 **Mr Bradshaw:** Thank you, Chair. As a matter of interest, I wanted to briefly ask Professor Metz a question. Were you making these arguments when you were the chief scientist in the Department? If so, were you losing them to the Treasury? Is that the background to this?

Professor Metz: I was chief scientist quite a long time ago, before the days of smart motorways. I would observe that the economics profession is very dominant in the Department. Economists think that they have a good handle on safety because they can value a fatality. My sense is that if you can generate a benefit-cost ratio of greater than two being high value for money, including the safety benefits, there is a tendency to feel that you have been doing the right thing.

Actually, safety is a more complex factor, particularly when safety may worsen because the value of a life in that situation may be quite different from the value you would attribute when you were improving safety. There is a whole range of inputs to policy making. Arguably, the economists are a bit too dominant in the Department for Transport.

Mr Bradshaw: Thank you. That is really helpful.

Chair: Professor Metz, Sarah Simpson and Mike Mackinnon, thank you very much indeed for giving us so much evidence and for starting us off so well. I asked you what the Secretary of State for Transport should do, but we will obviously make our recommendations as to what we think he should do. I hope you will follow the rest of our inquiry until we do so. Thank you again.

Examination of witnesses

Witnesses: Jonathan Spruce, Becky Needham and Kate Carpenter.

Q174 **Chair:** A very good morning to our second panel. Sorry we are a little late starting. Let's do some introductions first of all, starting with Kate Carpenter. Could you introduce yourself, your name and rank, and your link to smart motorways?

Kate Carpenter: I am representing the Chartered Institution of Highways and Transportation, a professional institution that represents professions working in the planning, design, building, management and maintenance of highway infrastructure.

I am a chartered civil engineer. I am a Fellow of the Society of Road Safety Auditors. I have been working in road safety for 23 years. I have

been working in smart motorway safety governance since 2009. Safety governance is the specialism in highways improvements that is the critical friend holding designs and highway authorities to account. Our role is to ask the difficult questions. That is what I have been doing.

Q175 **Chair:** Thank you very much. It is also my role to ask difficult questions. Let's go to Becky next.

Becky Needham: Good morning, everyone. My name is Becky Needham. I work as a road safety officer at RoSPA, the Royal Society for the Prevention of Accidents. I work in the road safety policy team, which contributes to our overall vision of life free from serious accidental injury. Unsurprisingly, our main interest in smart motorways is in regard to safe use and safety. We have a fairly small team, but we have been doing quite a bit of work in this area, such as contributing to this inquiry.

Q176 **Chair:** Good morning to you, Becky. Finally, Jonathan.

Jonathan Spruce: My name is Jonathan Spruce. I am a fellow of the Institution of Civil Engineers. The institution has about 96,000 members globally. We do not only accredit our engineering profession; the wealth of knowledge that we use in the institution helps deliver sustainable and safe infrastructure outcomes for future generations.

Q177 **Chair:** Good morning to all three of you. We have quite a bit to get through with you, so I ask you to be brief in your responses. There will be time to add to your response. It gives us a good structure. To start off, I want to ask whether you feel that we need more smart motorways rather than fewer.

Kate Carpenter: The objective of smart motorways is to improve capacity at the lowest operational cost, as mentioned in the previous discussion, importantly without reducing safety, both for users of the road network—everything from motorcyclists to car users, goods vehicle users and so on—and for workers. Both of those are assessed.

The actual safety performance in the most recent five years' data shows that all forms of smart motorway—controlled motorway, dynamic hard shoulder and all-lane running—have a lower collision rate than a conventional motorway with a hard shoulder. That might be counterintuitive, but that is the finding at the moment. Therefore, CIHT supports them, provided the environmental and economic case is clear.

David Metz flagged earlier the issue about induced traffic, for example. We think that is something that needs assessing. On that basis, they are safer in performance than existing conventional motorways. Therefore, our view is that the case is made, but they need to keep being monitored both as to collisions and driver behaviour.

Q178 **Chair:** Did you listen to the evidence from the witnesses beforehand?

Kate Carpenter: I did.

Q179 **Chair:** They took a very different view. Why is it that they come to a different view from you? Where have they got their modelling wrong?

Kate Carpenter: One of the things we find in road safety is that behaviour can be very counterintuitive. Some of the things that we have looked at in the last 10 years are the removal of street lighting on rural roads, the removal of the pedestrian guard rail and the change in urban design and street space. The things that people thought would be worse turned out to be better, because behaviour is elastic. It changes in response to the environment. A theoretical worsening of safety does not necessarily result in an increase in actual collision involvement, particularly for the high severity incidents.

It is counterintuitive. My personal view when I started work on smart motorways was that they seemed high risk and counterintuitive, but from what I have seen in the 13 years that I have been working on them, the actual performance is different from what you might expect intuitively.

Chair: Thank you. I applaud the length of your answers. It is really good for us to follow.

Q180 **Karl McCartney:** Kate, I am going to come straight back at you, if that is possible, because my feeling is counterintuitive as well. I understand that you might be taking it in the round. I can see that drivers on smart—as they are called—or controlled motorways will act very differently from those on other motorways that are not smart, controlled, monitored or lower speed.

If we strip out from the data that you have seen—I know that statisticians can use statistics like drunks use lamp posts—how many accidents or breakdowns that have occurred on a normal motorway have resulted in deaths or really bad injuries compared with the number of similar type accidents/breakdowns on all-lane running, rather than taking it in the round as the performance of the motorway as a whole? My intuition tells me that all-lane running motorways are going to perform, if we want to use that word, worse.

Kate Carpenter: The stocktake report that was published in May this year was an update of the report a year ago. It reports a conventional motorway having a fatality rate per mile travelled of 0.16. That is the highest of all the types of motorway.

Q181 **Karl McCartney:** Let me stop you there, Kate. You are not dealing with what I have just asked. I asked specifically for where there have been accidents or breakdowns in a live running lane on a normal motorway compared with those on a live lane/smart/controlled motorway. I do not think at this point in time that you or your colleagues have looked at that. You are looking at the statistics in the round—that is, the whole performance of the motorway. I do not think that helps us.

Kate Carpenter: The stocktake specifically gives live-lane fatalities. Table 1 in the stocktake document gives live-lane fatalities in total. It gives live-lane fatalities per mile travelled. The live lane fatalities per mile

travelled are lower on all three types of smart motorway than on a conventional motorway for the last five years, 2015 to 2019. Those are the five years for which we have whole data. That is table 2 in the stocktake report.

Karl McCartney: Thank you for that. I have asked the questions I have asked. You know what I am asking. I think we will look at how those statistics and figures are reached and whether that is dealing with what I am specifically asking and searching for.

Q182 **Chair:** Kate has given the view that she feels that smart motorways are safer. Kate, are you then comfortable as a result with the continued expansion of the smart motorway network? That is just making sure I am not putting words into your mouth.

Kate Carpenter: There are two things that we feel very strongly. First, we understand that many drivers are very anxious about smart motorways. That has a real potential effect. They might divert on to other roads. A big concern for us is about communications and public understanding. If people are fearful of smart motorways and they travel on A roads, where they are far more likely to be killed per mile travelled, that is a real risk.

I have two provisos for continuing with both retention and expansion. One is that driver communication and understanding is addressed. The Transport Focus report addressed this very well, saying that it is very important that we have the public on board and that we keep addressing it. It is not a one-off issue.

The second proviso is that we must continue to monitor all incidents and collisions to understand what is happening, to inform ongoing design, operation and public information. We do not just say that it is a done deal because I do not think it is. The numbers statistically are quite small. Therefore, the more time that goes by, the more statistical validity they have. The principle is that the public are concerned. They are not interested in statistics. They feel unsafe, and that matters. They may be safer in terms of fewer fatalities, but if they do not feel safe, there is a danger that they will take decisions that make them more at risk.

Q183 **Chair:** Thank you, Kate. That is a really strong opening. Becky, what is RoSPA's position? Do we need more smart motorways?

Becky Needham: We believe that either smart motorways or other changes to roads are required to tackle the congestion problem, but for us what was and always will be key is that any measures we take to improve the efficiency of our roads are not at the expense of the safety of road users. We have some safety concerns about some of the existing smart motorway schemes. I am not sure if you would like me to go into that now or later.

Q184 **Chair:** We will touch on that later. To be clear, is your view that, if it encourages people to come off less safe A roads and get on to a smart

motorway, smart motorways are a positive? I just want to be clear on your opinion.

Becky Needham: We know that the statistics show that, if people are displaced on to A roads, they are less safe statistically than on smart motorways. Motorways carry 20% of traffic and there were, sadly, 105 people killed in 2019 on our motorways. That is compared with 994 people who were killed on rural roads and 653 on urban roads. We know that on A roads you are three and a half times more likely to be killed.

Q185 **Chair:** On that basis, you are an advocate of smart motorways, just so that I can be absolutely clear. I want to get your clear opinion on this.

Becky Needham: It is a difficult thing to answer because we have concerns about the schemes as they are. If the action plan was not taken forward, we would not be an advocate of the motorways, but we believe that, with the action plan and some further measures, they could be improved and made safer, and therefore rolled out further.

Q186 **Chair:** The whole idea of this Select Committee is to take balanced evidence and opinions. Please do not be backwards in coming forwards with your opinions, otherwise we would not be inviting you. Do not shy away from having a good, strong opinion either way. Jonathan, I have set you up on that note.

Jonathan Spruce: Chair, that is such a great invitation. Thank you for that. As Becky alluded to, the first point is: do we need to improve the capacity and resilience of our strategic road network? Fundamentally, yes, the strategic road network is the backbone of our road network. It supports the UK economy, particularly for moving goods around.

As Professor Metz alluded to in the earlier session, sometimes you have local journeys on that network and that should not be the case. There is a bit of a mix and match. Our view is that you need to improve the network. There are pinch points on the network, and you need to try to ensure that the most appropriate journeys are made on the most appropriate roads. That is the first thing.

To go on to your direct question about whether we need smart motorways, if smart and controlled motorways provide you with the safest, the most cost and time-effective means of delivering additional capacity where it is required, and it is shown that that is the case, then, yes. It is a blunt question. I think we should be looking at what we want from our strategic road network to support our economic recovery and our economic growth, and then how as engineers we provide that capacity and resilience in the safest, cleanest, greenest and most resilient way.

Those are the sorts of questions that get lost a little bit in the debate about smart motorways. We tend to dive into the detail. I appreciate that this Committee is about that, but fundamentally there is a starting point

about whether we need to improve the resilience and capacity of our network. I think that over time we do, yes.

Q187 **Karl McCartney:** Just as the Chair challenged the two other witnesses, Jonathan, you obviously seem to be an advocate for smart motorways. I think we all would be if smart motorways were motorways that were controlled and also had hard shoulders. Is that not the case for you and perhaps those you represent?

Jonathan Spruce: I think you are absolutely right, Karl. What we are saying is that they need to be the safest that we can make them. Are all the smart motorways the safest that we can possibly make them on the network at the moment? I think probably not, no. We can learn lessons from those and we can make them safe.

You have to remember as well that this is about how, as a profession and a group of engineers, we learn lessons and make adaptations. It is strange to think that the very first motorways that were built never had a central reservation barrier. They just had a strip of grass in the middle. We would never do that these days. We have learnt from how we have developed and designed. That is the issue; we should be adapting and learning.

We talked before about the use of technology, and we will come back to it later, I think. We should be designing our future network and infrastructure around a vision of what we want it to be, and that is as safe as possible. I think we are all agreed that there is potentially a sweet spot about the way we can develop our network in a safe and resilient way. Have we got there yet? Probably not. The evidence says that. We need to keep learning and moving forward towards that safe outcome. That is the outcome we want.

Karl McCartney: Thank you.

Chair: Excellent. That is a strong start. Let's now move to the economic and business case for smart motorways and whether there are benefits that justify them. Over to Grahame Morris.

Q188 **Grahame Morris:** Jonathan, to follow on from your last answer, you raise a really interesting issue about its being a dynamic process. I am thinking of some local examples in the arterial road network in my part of the country, where design, over time, has addressed issues of drainage and crossover barriers that have significantly reduced the number of fatalities and serious accidents.

I am very conscious that Sarah Simpson told us in the last session that we are not comparing like with like in our general description of smart motorways. In your view, Jonathan, are all-lane running motorways the most suitable type of smart motorway? That is not withstanding Karl's earlier question about a hard shoulder. I want to be clear that we are making the right description or comparison.

Jonathan Spruce: If I can come back on that, the answer probably depends on the question you are asking. Does it deliver the largest amount of capacity increase? Yes, an all-lane running motorway does. Does it deliver the safest per-vehicle mile? The stocktake says that it does. Does it deliver a consistent approach? Probably not. Does it give you an understanding? Does it reduce the risk of people's behaviour, misunderstanding what it is about? Probably not. It just depends on the question you are asking and where you are trying to get to. In the earlier session, you talked about previous times. The cost-benefit ratios have been driven by the value of time saving and journey time saving, which an all-lane running motorway would probably give you.

Part of the problem is about the level of consistency, education and evolution that Kate talked about. It is almost like a blunt argument. Is it smart or is it not smart? Is it dynamic or is it ALR? We are losing the case. What we may be trying to do is solve problems at particular locations but on a consistent basis. It is the consistency that is causing the problem.

An all-lane running motorway will in theory, as you said before, give you a greater level of capacity, but not if there is somebody driving in lane two at 55 mph because they are fearful of being in lane one, the new lane one, or they do not know that it is operational. Similarly on a dynamic hard shoulder, the solid line and the rumble strip that makes the horrible noise when your wheels go across it, which is a valuable safety benefit, may deter people from using it. Do I use it or do I not use it?

I think the issue is consistency of approach. Maybe that is what we need to look forward to. We need to say, "What is a consistent approach that we can get behind in terms of a public education campaign, which understands and makes the improvements that we are trying to make as safe as possible?"

Q189 **Grahame Morris:** Thank you. Becky, we know that the stats that Kate referred to in her opening remarks seem to demonstrate that smart motorways are as safe as or safer than conventional motorways. It seemed to me that RoSPA is in agreement with that.

In what particular ways are all-lane motorways less safe? Are there any ways in which they are less safe? I am thinking about what Kate said originally and the perverse things that happen, when people decide not to travel on a smart motorway because they are nervous about it. They travel on rural or A-class roads that are less well lit, less well maintained and that they are less familiar with. They are more likely to have accidents if we look at it purely on safety rather than on cost or time-saving arguments.

Becky Needham: We believe that, although the evidence suggests that smart motorways are safer in most ways, there are some ways in which they are not as safe as the conventional motorway. With the all-lane running schemes, our particular concern is obviously the risk of live-lane

breakdown. We are concerned that, on some existing schemes, the emergency refuge areas, which are designed for motorists to use in the event of an emergency, are as much as 1.6 miles apart. That means that some drivers who break down are forced to stop in a live traffic lane because they cannot reach that lane.

We are aware that the action plan outlined that emergency refuge areas on new schemes should be 0.75 miles apart, where feasible, and that the design standards would be amended to a mile apart maximum. If they went with the three quarters of a mile, at that level of spacing a motorist travelling at 60 would reach an emergency refuge area every 45 seconds, which would be an improvement on the existing schemes. Our main concern is that there is not a clear commitment to a retrofit scheme for emergency refuge areas, so we are particularly concerned about the safety of the existing schemes.

Q190 **Grahame Morris:** Kate, this is the same question, but I will put in an additional aspect. It is in relation to the Government's plans to abolish motorways that have a dynamic hard shoulder. Is that the right decision? Again, there is the issue of whether we are comparing like with like. Do we know the relative benefits of each different type of smart motorway? Do we know enough to make informed decisions?

Kate Carpenter: When I first started working in it, my belief was that dynamic would be safer than all-lane running because we had the hard shoulder available at off-peak times. If a driver got into difficulty, they had somewhere to stop.

One of the difficulties with that is that it creates a more challenging environment. Drivers have more things to work out, such as which lanes are open and which are not, which speed limit they can go at, and which lanes are for which destination at their downstream junction and so on. It seems to have caused more of a challenge for drivers. ALR is the same all the time, so you have less uncertainty. The theory is that dynamic hard shoulder is safer, and the stocktake shows that it has a lower collision rate, albeit that it fluctuates very widely from year to year. Therefore, we need to be quite mindful and keep monitoring that to understand it.

I support the conversion to have less variability. If you drive up the motorway, you might drive on a bit of standard motorway with a hard shoulder, then a bit of all-lane running, then a bit of dynamic hard shoulder when the hard shoulder is open, then a bit of all-lane running, and then a bit of hard shoulder when the hard shoulder is closed. It can be quite challenging for drivers to attend continuously to what the environment is. I think less variation is helpful.

One of the important points is that most stops on motorways, including most stops in emergency areas, are illegal discretionary stops. Part of the challenge is to make sure that drivers understand what they need to do to help themselves be safe, as well as what the highway authorities need to do. Tens of thousands of people run out of fuel on English motorways

every year. Tens of thousands have tyre blow-outs due to bald or incorrectly inflated tyres every year. Those are things that people could avoid by their own actions, and keeping cars well maintained and so on. There are things that people can do themselves. That combination is very important for us.

All-lane running shows a better safety performance than conventional. In theory, dynamic is better but it is more challenging and more confusing. Also, you have to have staff in the control centre 24/7 if you want to be able to open the hard shoulder 24/7, and that is not actually the case. A lean and more self-understanding network, we feel, is supported. The methodology by which that is assessed is a complex, sophisticated hazard log with over 130 hazards. Each is scored for frequency per mile per year, the chance of them causing a crash when they occur and the likely severity of that crash. That is very carefully analysed to make sure that it is properly understood and to identify what the design needs to do to make it safe.

I think there are good processes in place, but it definitely can be better. There are two measures. The stocktake talks about improvement. One is stopped-vehicle detection, which I am massively supportive of. We really feel that that could be of huge benefit in speeding up the detection of somebody if they break down. People often do not ring in. They do not ring 999. They might ring the breakdown company, but they might not ring 999. They might not call for help. That is important.

The emergency refuge issue is quite complex. I have not managed to find any evidence that says that, on the places where the refuges are closer together, they have a lower live-lane breakdown than when they are further apart. Again, that is counterintuitive. At the moment, I do not think that we have any evidence for that. It does not mean we should not have sufficient refuge areas. For example, if you put them near junctions where people are weaving left to right and right to left, you can make safety worse rather than better. You might create more scenarios for people to do hazardous things. We need to be very mindful of unintended consequences.

Grahame Morris: Thank you. Jonathan, unless you have very strong views that differ from those already expressed on dynamic, I will hand back to the Chair, because I know we are short of time.

Chair: The next section we want to drill into is the removal of the hard shoulder and the risks of a live-lane breakdown. Kate has already taken us into that, but I will hand over to Ben to explore further.

Q191 **Mr Bradshaw:** Kate, you said that a lot of live-lane breakdowns are caused by drivers not maintaining their cars properly or running out of petrol. Shouldn't we design motorways for that sort of human frailty?

Kate Carpenter: It depends on how many lanes and how much impact you want. As Jonathan described, the objective is to provide the highest amount of capacity, with no safety detriment, as efficiently as possible. If

we want a hard shoulder as well as an extra lane for that capacity, that is a big environmental impact. The safety evidence is that it actually causes more crashes if you have a hard shoulder than if you do not. There is a danger of providing a thing that makes people think they are safe, rather than a thing that actually reduces injuries.

There was some interesting research done looking at eye tracking, where people driving along a motorway—*[Inaudible]*—time looking at the hard shoulder, even when there was nobody there, which means that for all that time they were not looking in their lane. What we want is people looking in their lane and concentrating. That gives safe performance. If somebody breaks down, yes, we should be designing for all the things that happen, but we should also be holding drivers to account, to comply with the law and not put other people at risk.

Q192 **Mr Bradshaw:** I think last March the Government said that, overall, smart motorways were safer, but not in every way. Some people might say, "But, hold on, if you're accepting a level of risk in one area to deliver a better outcome overall, then that's a bit ethically dodgy." What would be your response to that?

Kate Carpenter: The ethics for me are very powerful. We should ask ourselves what actually reduces collisions, not just what reduces theoretical risk. When we started scoring hazard logs, we were essentially overscoring the frequency of incidents. There are fewer incidents than we expected. That tells us that behaviour changes, so it is important.

You should not worsen one road user group's safety at the expense of another; for example, you should not make it more dangerous for motorcyclists and safer for car drivers. That would be unethical. Making car drivers safer in net terms, with fewer crashes per mile, is perfectly ethical for me. I do not have any problem with increasing one hazard and decreasing another in net terms. Shunts in moving traffic and lane changes—not just live-lane breakdowns—are very high-frequency incidents. If you add increased capacity, you smooth traffic flow, and that is one of the things that reduces flow breakdown and causes crashes.

It is more complex than simply the one hazard. We definitely need to focus hard on that hazard and making it as safe as possible, but it should be a net approach to what makes people safer.

Q193 **Chair:** Kate, perhaps I could stay on that theme. We have taken evidence that suggests that car drivers are more likely to collide with cyclists who are wearing a helmet than not wearing a helmet because they assume that the person is not going to be as impacted. Is there a similar concept that you are giving us with your analogy?

Kate Carpenter: Definitely. Behaviour changes continuously in the face of the environment people are in. It was mentioned earlier that on all-purpose trunk roads, for example, dual carriageways do not have as high an injury rate as you might expect. If the hard shoulder is a critical safety

feature, you would expect dual carriageways to be much more hazardous and injury involved than they are. There is a complex mixture of the physical environment that people are in and the way they change their behaviour.

The technology on smart motorways feeds that. As traffic starts to slow down due to congestion or an incident, further back up the road reduced speed limits are set. That is automatic. That technology very much smooths traffic flow and it reduces shunts. Often, the shunts are not where the breakdown occurs; they are further back up the road.

Q194 **Chair:** I want to touch on the Government's action plan. I will put this to all three of you. Becky, do you feel that the Government's action plan goes far enough or should more be done to improve the levels of safety on smart motorways?

Becky Needham: We would welcome the measures that have been outlined in the action plan. We believe that they go some way to address the risks faced on smart motorways.

Coming back to the point about the emergency refuge areas, and other points in the action plan, our concerns are that the measures in many cases seem to apply to new schemes. It is not clear whether all measures will be retrofitted to existing schemes. Our main concern is around the emergency refuge areas. We know that you are more likely to reach emergency refuge areas if they are closer together, and drivers can see them, there is signage, and they are well identified.

Q195 **Chair:** Instinctively, I would have thought that to be the case as well, but Kate mentioned that statistically there is no evidence to state categorically that that is the case. If there is only a finite amount of money, are we not better spending it where we really know that statistically it will enhance safety, rather than putting it into something that looks like it will, but statistically there is no evidence to suggest that it will at all?

Becky Needham: We have evidence that people are breaking down in live lanes. From memory, the action plan shows that on all-lane running around 40% of breakdowns are in the live lane. That is really concerning. If there isn't stopped-vehicle detection in place, people on average are being left for 17 minutes before they are identified. We simply think that is a terrifying ordeal for a motorist.

In a previous session, Edmund King spoke about some evidence that, when people can see the emergency refuge area, they are more likely to try to make it to that refuge area because it is in their eyeline.

Q196 **Chair:** Jonathan, what is your view of the Government's action plan? Do you think it goes far enough?

Jonathan Spruce: It is a good staging point. It recognises the idea of where we are getting to. It is a staging point, and we need to learn and

evolve. We also need to recognise that this is a system. As well as the hard infrastructure and some of the retrofitting around things like stopped-vehicle detection and improved distances between emergency refuge areas, which are very laudable and will address some of the issues that we found, there is the idea of how a public campaign could work. I know that Highways England has done some of that with the Keep Left campaign. You talked a little bit in the previous session about international comparisons. How can we lead the world in some of the in-car technology talking to out-of-car technology to make our roads as safe as they possibly can be?

I think the action plan reflects a position in the stocktake. Does it go far enough? No. As I said before, I think the concept of a smart motorway is fine and accepted in what we need. Its application has had problems and we are learning from that, but this is about a third way. What is our vision for our road network, the safest, greenest and most reliable road network, and how do we get there? We do not see it as a finite action plan that we are going to implement. This is a rolling evolutionary process for engineers, practitioners and the wider industry.

We could take a real step forward in the UK to try to do this. It is something we have the capability to do, particularly on the technology front. We could look beyond the original action plan that deals with a few of the immediate problems. If we are to solve the future network and lay the groundwork for a clean, green, safe, reliable network, we need to carry on with the action plan and build on it.

Q197 **Chair:** Finally, before I bring Karl in, can I ask you, Kate, the same question about the Government's action plan and whether you feel that it goes far enough and does the right job?

Kate Carpenter: I would support the measures currently proposed. CIHT members are involved in design and management on a daily basis. What we see are the outcomes of injuries. We would support anything that reduces the likelihood of those injuries. I support actions to make improvements. Our motorways are already the best in Europe, and among the very best in the world. All-lane running is shown to have fewer collisions than even the conventional motorway, but it does not mean you cannot make it better. What is important is that we continue to monitor the behaviour, the occurrences, the near misses, the collisions and their type to understand what is causing them—it is often not what we think is causing them—so that we continue to use evidence and not intuition to decide how to make things even safer.

Q198 **Karl McCartney:** My question is for all three of you, but I will come to you first, Kate, as you were last in the previous question.

If you had the job of designing a new motorway, or perhaps were travelling to work every day for two hours on a motorway in maybe a conventional car that was not very reliable, or in an electric vehicle that occasionally broke down catastrophically with no electric power, what

type of motorway would you prefer to be on or to design?

Kate Carpenter: I drive on smart motorways every week, both all-lane running and dynamic hard shoulder. I do not personally feel any less safe on any of them. That is not just because of what I do, but I was taught from an early age that you plan your journey, make sure you have enough fuel and so on. I look at what I can do to keep myself safe. I do not feel less safe.

There is concern about electric vehicles. There are two different things. They are not more likely to break down and they have very reliable information about how many miles they can still travel with the current charge. There has been some research done—a relatively small dataset but useful—into how many miles people thought they could travel when the red light came on. It was a lot more miles than they could actually travel. That is why people run out of fuel; they have optimism bias. Electric cars are very reliable. When they break down, they cannot be towed or pushed so they have extra challenges for motorway safety. When they catch fire, it is harder to put out, so there are complexities.

Q199 **Karl McCartney:** The fact that they are electrical and will not be producing any light if it is in the middle of the night on an all-lane running motorway is pretty fearful. Have you ever broken down on a live-lane motorway, Kate?

Kate Carpenter: No. I have seen a lot. I have watched a lot of CCTV of breakdowns and seen the near misses of vehicles driving around after shunts. I have seen it at work, and personally.

Q200 **Karl McCartney:** Thank you. Jonathan, what type of motorway would you prefer to drive on?

Jonathan Spruce: I have no preference about driving on a particular type of motorway. What I would say is that I would want to drive on a motorway where I felt that, if there was an incident, there would be a reaction to that incident.

Q201 **Karl McCartney:** A managed motorway, maybe?

Jonathan Spruce: We talked a bit before about controlled and managed motorways. Smart motorways were originally called managed motorways. We renamed them smart motorways, but that takes out the human factor a little bit. I think it is about understanding that when an incident happens there will be reactions around me, and that I am aware of what I need to do in that incident.

We should not forget that even if you break down on a hard shoulder, although you are not in a live running lane, the advice is still to get out of the vehicle and move over to the other side. It is not necessarily 100%, even on the hard shoulder.

Q202 **Karl McCartney:** It is safer but, as you say, it is not a completely safe place.

Jonathan Spruce: It comes back round to the system. We need to work on the educational thing. I have no preference. I would just like it to be consistent.

Q203 **Karl McCartney:** Finally, Becky?

Becky Needham: Personally, until smart motorways have been retrofitted with more regular emergency refuge areas, I would probably prefer to travel on a controlled motorway where there is a permanent hard shoulder.

Karl McCartney: We have received that key message loud and clear. Thank you all.

Q204 **Chair:** I want to ask about stopped-vehicle detection technology. I think I would be right in saying that you are all in favour of that; is that correct? Kate as well? You are an advocate of the vehicle technology that detects whether you have stopped in a live lane.

Kate Carpenter: I lost your sound for a minute. Were you asking me a question?

Q205 **Chair:** I just wanted to confirm it. I did not want to assume anything, but I would be amazed if you were not in favour of it. Are you all in favour of stopped-vehicle detection technology? Yes.

On that basis—

Kate Carpenter: It is much more reliable than it was. There was some mention earlier of its reliability. It is much more reliable than it was when that research was undertaken, as I understand it.

Q206 **Chair:** Back in 2016, when the previous Select Committee did its report, we were given assurances by Highways England at that time that all future smart motorways would have that technology incorporated, and that they would retrofit. That has not occurred. Indeed, it is somewhat galling to many that the Government are now promising that that will be delivered 12 months early in 2022. Some would say it is six years too late.

What the Government have said is that, going forward, all new smart motorways will have to have that technology in place. Do you feel that the Government should go further, though, and say that no more smart motorways should be created until retrofitting has occurred to the existing network of that technology?

Jonathan Spruce: I don't necessarily agree with that point, Chair. You alluded to it before. If we are looking at a roll-out that takes the whole network and the whole system, it is about where you would spend finite amounts of investment. With some of the retrofitting, if there is not necessarily an accident case to look at that retrofitting immediately, you may want to spend the money to introduce a new section of controlled, managed or smart motorway, whatever you want to call it, where there is a greater level of need.

In the round, you will get wider benefits in relief to other parts of the network, and safer parts of A roads and diversion roads. Just to say that we should all retrofit before we move on misses the point about specific locations and need in a specific location. I think there will be areas where you would want to retrofit, but there might be areas where, in a rolling programme of activity, there is greater need and an overall benefit to all users to do some more roll-out of a smart system. Again, it comes back to a consistent basis allied to what you are trying to do with the vision for your road network.

Q207 **Chair:** Becky, do you agree with Jonathan's point, or do you have a different view on retrofitting?

Becky Needham: Our view would be slightly different because safety is absolutely key for us. We know that where stopped-vehicle detection is fitted, a vehicle can be identified, when it has stopped, within about 20 seconds. That compares to 17 minutes on schemes without that technology installed. It is absolutely vital that the technology is retrofitted to existing schemes and not just prioritised for new ones.

Q208 **Chair:** On that basis, would you agree with the view that further roll-out should not occur of smart motorways until all the existing smart motorways have that technology in place?

Becky Needham: It is difficult to answer, but we believe that if rolling it out on new motorways is going to delay it on existing schemes that are already being used by road users, and they are already breaking down on them, then yes.

Q209 **Chair:** Kate, where do you stand on that?

Kate Carpenter: For me, I go with the data, which says that all-lane running, even without stopped-vehicle detection, has a lower fatality rate than conventional motorway, but it still needs to be made much safer. The two need to run in parallel.

It is not an easy thing to implement. There is a perception that you just chuck up a couple of posts and it is in. It is much more complicated than that. I do not think any new scheme should be implemented without it, and we should be implementing it as soon as we can on existing schemes. That is happening at the moment, but it is complicated. They are already safer, but they can be made safer, and we should do that as quickly as we can.

Q210 **Chair:** Turning that on its head, I believe that the stretch of the M4 that was to be opened as a smart motorway will now be delayed because of the need to put stopped-vehicle technology in place. Do you disagree with that delay?

Kate Carpenter: It is finely balanced. I have not been personally involved in that one. I would advocate careful evaluation of the pros and cons. The stopped-vehicle detection definitely reduces the period that

somebody is stationary before they are identified, if they do not ring in. Part of the problem is that people do not call for help. The 17 minutes does not apply if somebody makes a phone call and the control centre knows about it. They do not need to wait until they have detected it using technology if somebody actively alerts them to it. It is not only the technology that does that.

In terms of delaying a scheme, provided it is safe in the interim, in a roadworks condition or a temporary condition, we do careful risk analysis of schemes when you do the handover process, as you go from the roadworks stage into the operational stage. It is very carefully managed. Provided that process is followed, as I am certain it would be, I would not have any concern about a delay, provided that in the interim period it is safer, and the risk assessment would take us to that.

Q211 **Chair:** Jonathan, do you agree with Kate's point that the M4 should not be delayed if it is safer, albeit that it could be even safer? If there is the technology to detect the vehicles, you should crack on and open it without delay.

Jonathan Spruce: My understanding is that the new regulations are that all new smart motorways will have stopped-vehicle detection. I think your original question was whether there should be a delay to include stopped-vehicle detection, and that is absolutely right. If the delay gets longer and longer, or you are trying to delay that to retrofit another section where, potentially, a significant accident or incident problem has not occurred, that is a slightly different question.

To answer your original question, we absolutely support a delay to the M4 scheme to make sure that it is as safe as possible, based on how long it should take. If it gets delayed further, or if there is a direct choice between a retrofit scheme and that scheme, that is a slightly different question. As Kate said, you would have to look at the data and what the overall benefits of a further delay were against the retrofit scheme being delayed in its place.

Q212 **Chair:** Okay. That makes sense. The last question is about the culture of Highways England. It appears to have got itself into a bit of a difficult position with regard to smart motorways. That may be unfair if you believe, as you do, that overall they are safer. Where do you think Highways England has perhaps got it wrong?

Kate Carpenter: I think we could perhaps have anticipated the driver anxiety and that response, if people were not aware of what was being done and why. I do not think there is high public understanding.

Drivers are inherently inconsistent. They simultaneously think that the hard shoulder is a safe place, evidenced by the millions of discretionary stops made on it illegally every year, and also that all-lane running is very dangerous. That suggests that they think the hard shoulder is a safe place but motorways are not. I think we have an inconsistency in that.

Highways England needs not only to deliver the safest infrastructure but to bring the public with it. With hindsight, I think that could have been identified. I was not involved in it at the time, so I could not comment on what was or was not known, or should or should not have been done. Understanding that for future communications is really important. It is being respectful of that fear, because the fear is real. It does not matter whether people are less likely to die per mile travelled. If they feel fearful, that is what changes the behaviour.

Q213 **Chair:** Thank you, Kate. Becky, do you agree with that, or do you have a different view?

Becky Needham: We would agree that there is a massive issue at the moment with public perception of these motorways. This is something that we experience at first hand. We get 10,000 inquiries a year through our information centre. Something that is very common at the moment is people calling up about smart motorways. Sometimes, they are upset because they have used a scheme and they are not sure that they have done the right thing, and that they could be reprimanded for that. Other people are in a position where they are planning a journey and say that they are too frightened to travel on the smart motorway. There is clearly a gap in knowledge around smart motorways. The education campaign could have come a lot sooner.

The other concern that we have is obviously around the emergency refuge areas. We are concerned that they were so far spaced out in the first place. We would have much preferred it if they were to the new standards, at a maximum of one mile and 0.75 miles where feasible.

Q214 **Chair:** Thanks, Becky. Jonathan, do you have anything further to add?

Jonathan Spruce: There are a couple of things, Chair. From the point of view of Highways England, potentially embracing that evolutionary development going forward a little bit more may be something. In their defence, there is an element of silos.

The last time I presented evidence to the Committee was back in March, and it came up again that they think in silos. They are thinking very much about the strategic road network, their key performance indicators and the funding they have for the strategic road network. Actually, this is about real life. It is about what we want from our transport system. It is about how we share modes. It is about the most appropriate roads for people to drive on.

Is there a wider role for us as the engineering community, and for Government across the piece to set out a vision for what they want for their transport network and to start validating that? It is how you develop that as well. That would bring in more about the driver behavioural stuff, about the technology and about collectively working together, rather than having a solution and then bluntly going out.

You mentioned finite funding. They have five-year funding settlements that are driven a lot of the time at the moment by vehicle excise duty. That is not going to continue as we shift towards electric vehicles and meet our net zero objectives. Future funding and the future way we design and develop our infrastructure as a whole, particularly our transport infrastructure, needs to be less silo-focused and more outcome-focused. If we get to that point, that is a big learning lesson from where we are. You might not then get the siloed approach and way of thinking that sometimes leads you to not looking around and taking a wider picture.

Chair: Thank you, Jonathan. Our next evidence session, which we believe will be the final public one, will be with the Department for Transport and Highways England. We can take some of those points to them.

We thank you very much, Jonathan, Kate and Becky, for giving us your views. You had very different views from the first panel, and it is absolutely right that this inquiry takes a good, balanced view. Thank you again, and enjoy the rest of your day.